

## ABSTRACT

### ABSTRACT

**[Para 78]** The present invention discloses a photonic waveguide that is based on natural index contrast (NIC) principle and also discloses fabrication details thereof. Such waveguide forms the basis of a class of chip-scale micro- and nano-photonic integrated circuits (PICs). The NIC method utilizes the built-in refractive index difference between two layers of dielectric thin films of two materials, created from nano-materials that are designed for optical waveguide applications. This new class of waveguides simplifies the PIC fabrication process significantly. Based on the NIC based waveguides, which by design possess multiple photonic functionalities, PICs can be fabricated for a number of photonic applications such as arrayed waveguide grating (AWG), reflective arrayed waveguide grating (RAWG), interleaver, interferometer, and electro-optic sensor. Additionally, several other PICs can also be fabricated via tiers of integration, such as triple-phase integration where multiple optical functionalities are monolithically integrated on a chip.